

Aconitum azumiense (Ranunculaceae), a New Species from
Nagano Prefecture, Central Japan

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アズミトリカブト—長野県産トリカブト属の新種

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A new species of *Aconitum*, *A. azumiense*, is described from Azumi District, Nagano Prefecture, central Japan. It is characterized by 1) glabrous pedicels, 2) indefinite terminal inflorescence, 3) ternate or deeply 3-lobed cauline leaves, 4) shallowly conical or navicular helmets with long beaks, 5) slightly inflated nectary lobes, and 6) the chromosome number of $2n=4x=32$. A key to *A. azumiense* and its related species is prepared.

The principal aim of this paper is to describe a new species of *Aconitum* from Azumi Province, Nagano Prefecture, central Japan. Although it was discovered in 1989, the occurrence of it was suspected from earlier as stated below.

I have already reported the presence of a peculiar aconite at Iyari Moor of Omachi City, Nagano Prefecture, central Japan (Kadota 1985, 1987b). At that time, I tentatively called it "the Iyari form." Plants belonging to the Iyari form grow sympatrically with *A. japonicum* Thunb. ex Murray subsp. *maritimum* (Nakai ex Tamura et Namba) var. *iyariense* Kadota (Kadota 1987d, $2n=4x=32$), which is similar to the Iyari form with pedicels densely clothed with rough-surfaced recurved hairs throughout the surface as well as tall conical helmets with long beaks. However, the Iyari form is significantly different from *A. japonicum* subsp. *maritimum* var. *iyariense* in

having pedicels which are almost glabrous but extraordinarily sparsely strigose with rough-surfaced recurved hairs at the proximal parts.

The pedicel indumentum has been usually treated as one of the diagnostic characters in the classification of genus *Aconitum* (e.g., Nakai 1953, Hardin 1964, Tamura 1972, Wang 1979, Woroschilov 1982, Kadota 1987d). It has also been noticed that the pedicel indumentum is slightly variable in some species. Then the variability in the pedicel indumentum was regarded as intraspecific (Hardin 1964, Tamura 1972).

I have reported several instances of natural hybridization among the species of Eastern Asiatic *Aconitum* (Kadota 1981, 1982, 1983, 1985, 1986, 1987a, 1987b, 1987c and 1987d). The natural hybridization occurs between the species at the same ploidy level; frequently in the tetraploid species group and occasionally in the diploid



Fig. 1. Habit of *Aconitum azumiense* at Horigane Village of Nagano Prefecture, central Japan, by courtesy of Mr. K. Hashido.

species group. The intermediacy of morphological traits is manifested in the pubescence of pedicels, sepals, stamens and carpels as well as the shape of helmets (upper sepals) and nectaries (honey leaves), and the mode of leaf division. Pedicels of the Iyari form show intermediacy between those which are completely glabrous and those which are clothed with rough-surfaced curved hairs throughout the surface. The features of the pedicels as found in the Iyari form thus suggests interspecific

hybridity. Hence the Iyari form was estimated to be of hybrid origin between *A. japonicum* var. *iyariense*, which showed sympatric occurrence with the Iyari form, and an unknown parental taxon which should possess at least glabrous pedicels and the same chromosome number. No candidates for the unknown parental taxon had been found in the Iyari area at that time in spite of repeated field survey. Then I made detailed explorations in central Japan to discover the parental taxon.

In December 1988, several specimens of aconite from Horigane Village of Azumi District were sent to me by Mr. Katsuya Hashido, Hotaka Junior High School, Nagano Prefecture. The village is located circ. 30 km south of the Iyari area. The specimens from the Tatai area of the village consisted of *A. japonicum* var. *maritimum* and the plants which showed close similarities to the Iyari form in pedicel indumentum and helmet shape (the Tatai form). The Tatai form was likewise estimated to be a putative hybrid derivative between *A. japonicum* var. *maritimum* and the unknown species. Then I made field examination in the village to discover the unknown aconite and to survey its state of occurrence with the aid of Mr. K. Hashido in September of 1989. As the result,

it has been revealed that the presumed unknown aconite is really existent; and that it is the new species here described, *Aconitum azumiense*. I could have also observed many individuals which are tentatively regarded as hybrid origin, and hence I will additionally report the presumed state of natural hybridization between *A. azumiense* and the other taxa in the Tatai area.

Voucher specimens (including chromosome vouchers) are preserved in the Herbarium of the National Science Museum, Tokyo (TNS). Herbarium specimens deposited in TI, KYO, SHIN and TNS were also employed in this study. Somatic chromosomes and pollen stainability were examined with the method adopted by Kadota (1984, 1987d).

Aconitum* (Sect. *Euchylodea*) *azumiense
Kadota et Hashido, sp. nov. (Figs. 1–2)

Differt ab *Aconitum kusnezoffii* laminiis nectariorum manifeste inflatis et calcaribus nectariorum brevioribus, casside elatiore, caule glabro, inflorescentia terminali paniculata; ab *A. kiyomiense* casside cuculata, rostro cassideis brevioribus, caule glabro, inflorescentia terminali paniculata.

Herba perennis 90–145 cm longa. Tubera anguste obovoidea fusca circ. 6 cm longa 1–1.5 cm diametro, rhizomatibus minus quam 5 mm longis. Caulis firmus teres primus erectus demum ex medio arcuato-declinatus, partis dorsalis 5–6 mm diametro, fere glaber sed sparsissime strigosus in dimidio superiore, pilis tuberculatis incurvatis; plerumque 8–10-plo ramosus, ramis 4–17 cm longis. Folia subcoriacea ambitu late obovata, pagina adaxiali atroviridia abaxiali glauca, utrinque fere glabra sed basi abaxiali sparsissime strigosa. Folia radicalia et inferne caulina emarcida sub anthesi. Lamina folii caulinae medii 12–20 cm lata 10–22 cm longa ternata, basi improfunde vel profunde cordatis; lobo medii obovato acuto

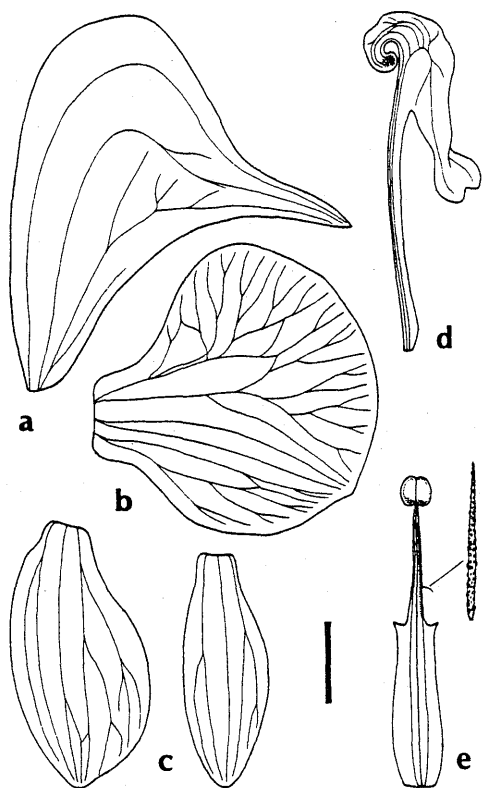


Fig. 2. Floral organs of *Aconitum azumiense* drawn from the holotype specimen (Kadota 20101, TNS). a. Helmet (upper sepal). b. Lateral sepal. c. Lower sepals. d. Petal (honey leaf). e. Stamen with a rough-surfaced, straight and subpatent hair. Bar indicates 5 mm for sepals and petal, and 2.5 mm for stamen.

5–10 cm lato 8.5–15 cm longo, improfunde pinnatim inciso; lobis lateralibus ovatis acutis 6.5–10 cm latis 8–9.5 cm longis bipartiti; laciniis lanceolatis acutis 4–6 mm latis; costa et venis lateralibus in pagina abaxiali manifeste erigentibus. Petioli leviter recavi, in pagina adaxiali canaliculati, 3–7 cm longi et laminas breviores fere glabrati sed secus canales sparsim strigosi, pilis tuberculatis recurvatis. Inflorescentia terminalis racemosa vel corymbosa circ. 4 cm lata circ. 7 cm longa plerumque 5–6-florifer bracteata; rachidi 1.5–6 cm longis; bracteis circ. 1 cm latis circ. 2 cm longis foliaceis trilobatis as instar foliorum caulinum. Inflorescentiae axillares corymbosae 2–5-floriferae. Pedicelli incurvati 3.5–4.5 cm longi omnino glabri bi-bracteati; bracteolis 2 linearibus circ. 1 mm latis circ. 3 mm longis infra medium pedicellorum sitis ad marginem sparsim strigosis. Flores caerulei-violacei vel atroviolacei 30–35 mm alti extus omnino glabri. Cassis breviter conica vel navicularis 8–13 mm alta 15–18 mm lata 18–23 mm elata longirostro sessiles, marginibus inferis parce converssis. Sepala lateralalia orbicularia circ. 18 mm lata et longa intus ad partes centrales hispida, pilis laevibus rectis ascendentibus et tuberculatis rectis ascendentibus. Sepala infera elliptica obtusa 5–6 mm lata 14–16 mm longa. Nectaria praeter dimidia proximalia labellorum lactae glabra; laminis vix inflatis 4–5 mm latis 6–8 mm longis; labellis paene ejusdem colorum quam sepalis ovatis emarginatis; unguibus leviter incurvatis vel fere erectis 13–18 mm longis; calcaribus incrassatis et longiusculis circinatis. Stamina fere glabra sed in dimidio proximalibus filamentorum sparsissimue hispida dentata, pilis tuberculatis subpatentibus. Carpella 3(–5) contingentia glabra. Folliculi et semina matura mihi ignoti. Semina immatura obpyramidalia horizontaliter lamellata.

Type: Japan, Honshu, Nagano Pref.,

Minamiazumi-gun, Horigane-mura, Tatai 680 m, Sept. 17, 1989, Y. Kadota 20100 (holotype: TNS).

Jap. Name: Azumi-torikabuto (nov.).

Distr.: Nagano Prefecture, central Japan (endemic).

Chromosome Number: $2n=4x=32$ (Kadota 20101, Japan, Nagano Pref., Minamiazumi-gun, Horigane-mura, Tatai, 17 Sept., 1990, TNS).

Aconitum azumiense is characterized by 1) glabrous pedicels, 2) indefinite terminal inflorescence, 3) ternate or deeply 3-lobed cauline leaves, 4) shallowly conical or navicular helmets with long beaks, 5) slightly inflated nectary lobes, and 6) the chromosome number of $2n=4x=32$. This new species belongs to Sect. *Euchylodea* Reichb. [Ueber. Gatt. Acon. 14 (1819) – Lectotype (Kadota 1987d): *Aconitum kusnezoffii* Reichb.] since this has the nectary lobes which are not tapering to the spurs but are slightly inflated. Among the species of this section, *A. kusnezoffii* Reichb. (Ser. *Euchylodea*), *A. kiyomiense* Kadota (Ser. *Euchylodea*) and *A. grosse-dentatum* Nakai (Ser. *Japonica* (Nakai) Kadota) are similar to *A. azumiense*, in having glabrous pedicels and the same chromosome number. *Aconitum azumiense* is clearly distinguished, however, from these three species by the following characters:

Key to *Aconitum azumiense* and the Related Species

- 1a Terminal inflorescence racemose – corymbose
- 2a Terminal inflorescence indefinite; helmets shallowly conical – navicular with long beaks; nectary blades scarcely inflated; nectary spurs slender and long; coiling to 360° *Aconitum azumiense* Kadota et Hashido (endemic to Horigane Village, Nagano Pref.)
- 2b Terminal inflorescence predominantly definite; helmets tall conical with short

beaks; nectary blades conspicuously inflated;
nectary spurs thick and short, coiling to
180° *Aconitum grosse-dentatum*
Nakai (Honshu and Shikoku)

1b Terminal inflorescence paniculate and in-
definite; nectary blades conspicuously inflated

3a Helmets cylindrically conical usually with
short beaks; nectary spurs thick and long,
coiling to nearly 180°
Aconitum kiyomiense Kadota (endemic to
Hida Province, Gifu Pref.)

3b Helmets conical with long beaks; nectary
spurs thick and short, coiling to less than
90° *Aconitum kusnezoffii*
Reichb. (N Korea, NE China and E Siberia)

Aconitum azumiense grows on floor of the
planted *Larix leptolepis* – *Cryptomeria japonica*
woodland. In the stands, *Morus bombycis*,
Staphylea bumalda, *Kerria japonica*, *Rubus*
crataegifolius, *Dioscorea japonica*, *Paederia*
scandens var. *mairei*, *Boehmeria tricuspis*,
Polygonum filiforme, *Cimicifuga simplex*,
Impatiens noli-tangere, *I. textori* etc. also occur.

This vegetational composition is quite common to
planted or secondary forests in the temperate zone
in the District.

Horigane village including the Tatai area is
situated in the east of the Hida Mountain Range.
In the Mountain Range, four species of *Aconitum*
are recognized and these four taxa occupy
ecologically distinct habitats; *A. senanense* Nakai
subsp. *paludicola* (Nakai) Kadota [$2n=4x=32$] in
meadows and tall herb stands of the alpine and the
subalpine zones, *A. sanyoense* Nakai [$2n=2x=16$]
in woodlands of the montane zone, and *A.*
azumiense and *A. japonicum* var. *maritimum* in
and along woodlands of the colline zone. Any
hybrid derivatives between them (except for those
between *A. azumiense* and *A. japonicum* var.
maritimum, see below) have never been collected
until now although there are no significant
differences in the flowering periods of the three
taxa in question. This situation may be caused by
the facts that the ranges of the three species are
segregated ecologically and vertically and that they
are different in the ploidy level. In this way, the
habitats of *A. azumiense* are so low in elevation

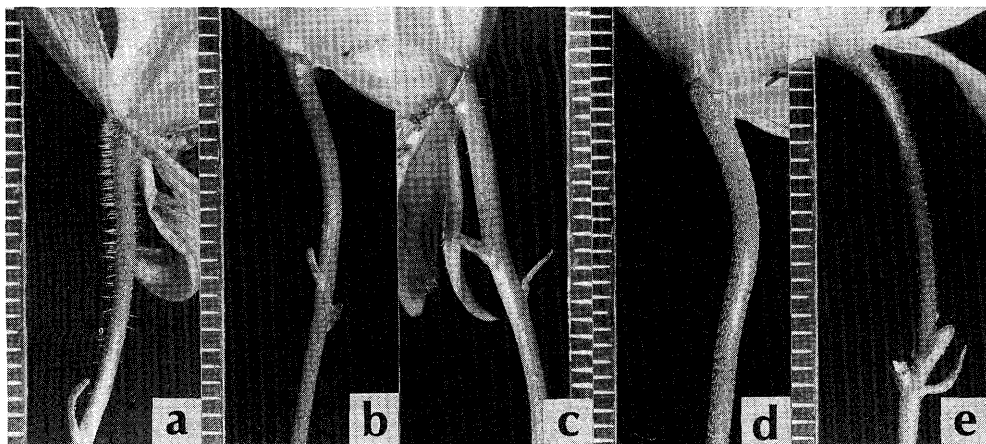


Fig. 3. Variation in pedicel indumentum of *Aconitum* population from the Tatai area. a. Putative hybrid between *A. jaluense* subsp. *iwatekense* and *A. azumiense* (Hashido 5402). b. *A. azumiense* (Hashido 5391). c. Putative hybrid between *A. azumiense* and *A. japonicum* subsp. *maritimum* var. *maritimum* (Hashido 5394). d. *A. japonicum* subsp. *maritimum* var. *maritimum* (Hashido 5411). e. Putative hybrid between *A. japonicum* subsp. *maritimum* var. *maritimum* and *A. jaluense* subsp. *iwatekense* (Hashido 5403). Original photographs were taken by Mr. K. Hashido.

and close to human habitations that human activities might have seriously influenced its existence. This is regarded as one of the reasons why *A. azumiense* is of geographically restricted and rare occurrence. This species is thus considered to be an endangered species.

Aconites from the Tatai area have shown a considerably wide range of variation particularly in pedicel indumentum (Fig. 3). As described above, it is probable that interspecific hybridization might have caused the variation. The following five entities are recognized; 1) *A. azumiense* proper (Fig. 3-b), 2) *A. japonicum* var. *maritimum* (Fig. 3-d) putative hybrids between *A. azumiense* and *A. japonicum* var. *maritimum* (Fig. 3-c), 4) putative hybrids between *A. azumiense* and *A. jaluense* subsp. *iwatekense* (Fig. 3-a) and 5) putative hybrids between *A. japonicum* var. *maritimum* and *A. jaluense* subsp. *iwatekense* (Fig. 3-e). The third taxon, *A. jaluense* subsp. *iwatekense*, is estimated to have been involved in the formation of the forms 4) and 5), considering the fact it is characterized by having pedicels villose with a mixture of smooth-surfaced patent hairs and glandular hairs. However, *A. jaluense* subsp. *iwatekense* has never been collected in the area up to the present.

The range of *A. jaluense* subsp. *iwatekense* chiefly covers the Pacific Ocean side of the Tohoku District, northern Japan (Kadota 1983, 1984, 1987d). Its westernmost habitat is located in Mts. Asamayama, which is circ. 60 km distant from the Tatai area. This subspecies is additionally considered to be a relict based on its rare occurrence, isolated distribution and less variabilities of morphological attributes (Kadota 1984, 1987d). Hence there is a possibility that *A. jaluense* subsp. *iwatekense* once existed and now becomes extinct in the Tatai area. *Aconitum jaluense* subsp. *iwatekense* seems to have left its morphological

characters in the forms of 4) and 5) by means of introgression. This assumption is supported by high pollen stainability of the forms (98.08–100%).

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要 旨

長野県産のトリカブト属の新種 *Aconitum azumiense* Kadota et Hashido を記載した。この種の発見そのものは極く最近のできごとであるが、本文中に記したように、これが存在することについては予想されていた。和名は、この植物が安曇地方の特産であるため、アズミトリカブトとする。アズミトリカブトの特徴は次のとおりである。1) 花梗は無毛、2) 頂生花序が無限的で、3) 葉身は3全裂～3深裂し、4) 上萼片が背の低い円錐

形あるいはやや舟形で、嘴が長く、5) 蜜腺(花弁)の身部がわずかに膨大し、距が細く長くかつ360°近くにまで屈曲する。本種は染色体数が $2n=4x=32$ であり、かつ無毛の花梗をもつ点で、*A. kusnezoffii* Reichb. ホナガウツ(アジア大陸東部)や*A. kiyomiense* Kadota キヨミトリカブト(岐阜県飛騨地方)、カワチブシ *A. grosse-dentatum* Nakai (本州・四国)などに類似している。アズミトリカブトとこれらの種との識別点は検索表として本文中に付した。基準産地の南安曇郡堀金村田多井地区では個体数が極めて少ない。これは生育地の標高が600～900 mと低いために、人の活動の影響を受けやすいことが最大の原因であると考えられる。アズミトリカブトは絶滅の危機に類した種の1つといえよう。また同地区ではアズミトリカブトと、ツクバトリカブト *A. japonicum* Thunb. ex Murray subsp. *maritimum* (Nakai ex Tamura & Namba) Kadota var. *maritimum* やセンウズモドキ *A. jaluense* Kom. subsp. *iwatekense* (Nakai) Kadota との自然雑種形成に由来すると推定される個体も得られている。これは本州、とくに近畿地方以北の地域でしばしば観察される、トリカブト属4倍種相互の交雑の1例である。

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